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(54) **Composite billiard cues**

(57) A method for producing a billiard cue comprises the steps of turning a proper length of wood blank into a tapered cue core, wrapping up the core with at least one layer of resin-dipped carbon fiber fabric to form a clad core, providing a covering tightly pressed onto the surface of the clad core, heating the clad core together with the covering under a predetermined temperature higher than room temperature, and removing the covering from the clad core. The cladding can be a plastic bag and a vacuum can be applied between the bag and the article. Alternatively the cladding can be tape winding.

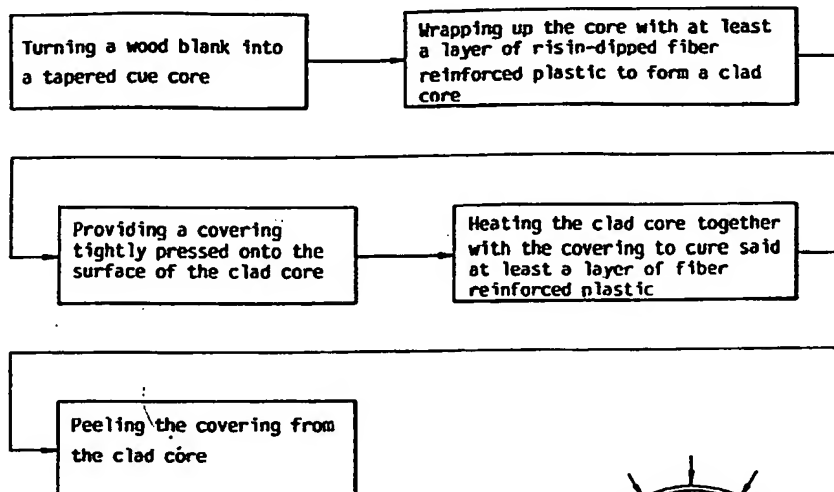


FIG.1

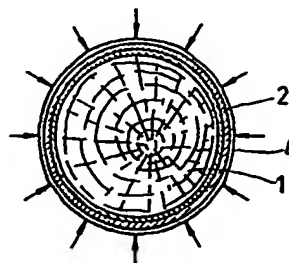


FIG.3

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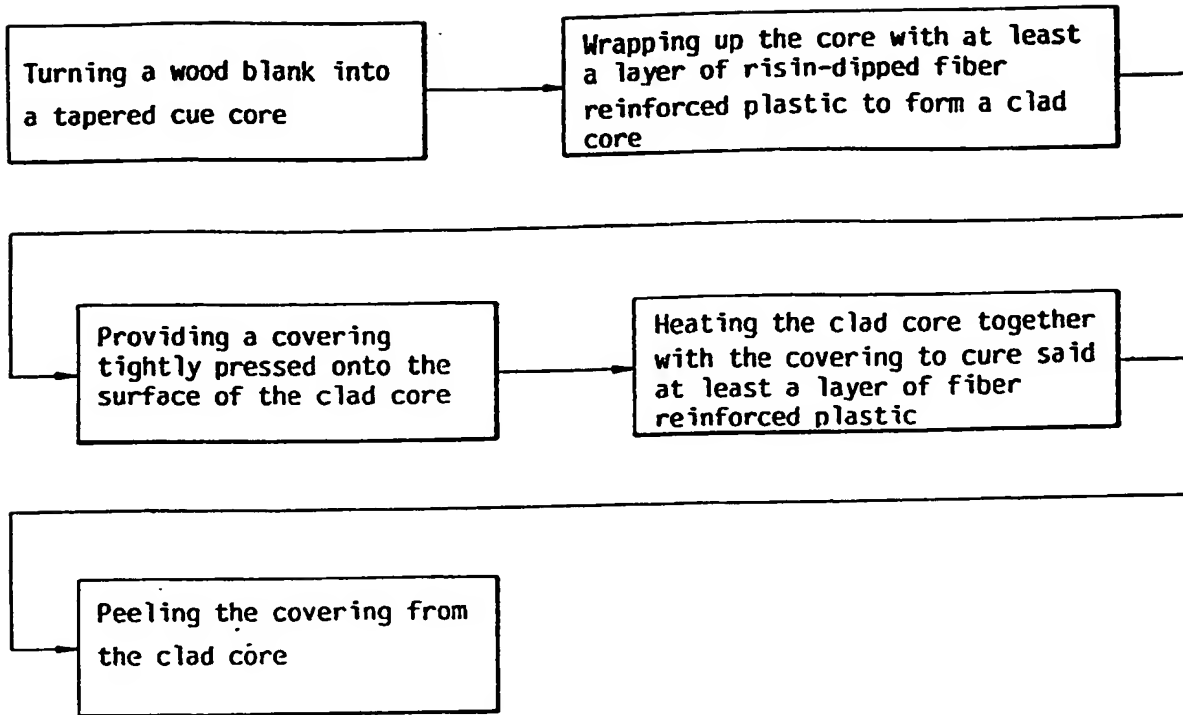


FIG. 1

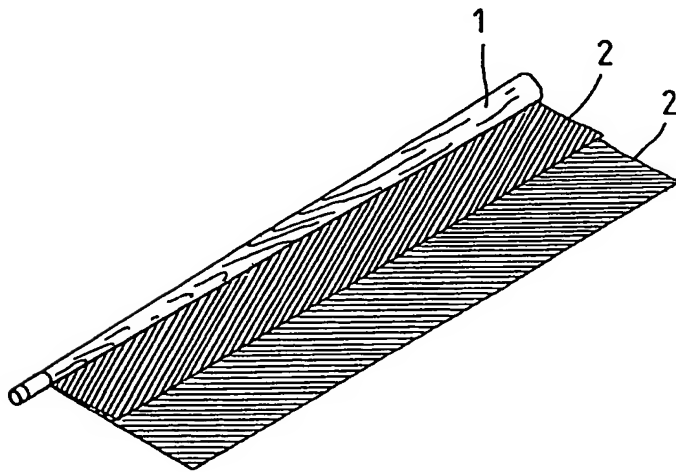


FIG. 2

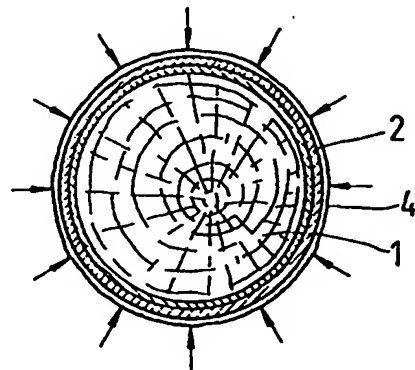


FIG. 3

## METHOD OF PRODUCING BILLIARD CUE

### BACKGROUND OF THE INVENTION

5 This invention relates to billiard cues, specifically a method of producing a billiard cue.

10 In a copending U.S. Patent Application Serial Number 07/202,813 filed by the same applicant on June 6, 1989, disclosed are a wooden cue and a manufacturing method thereof. According this prior method, a wooden core together with its cladding of fiber reinforced plastic is disposed in a mold set so that the same can be heated and compressed therein and consequently the  
15 cladding can be bonded and cured onto the surface of the core.

The prior method is disadvantageous in that a mold set must be provided each time for the manufacture of a  
20 single cue. Therefore, the mold cost for each cue is quite high and the method is time-consuming. Moreover, in case that the cladding of a cue core is not of fiber reinforced plastic, it may not be closely bonded onto the core by this prior method.

25 Accordingly, the primary object of the invention is to provide an improved method for producing a billiard cue by which the production cost can be reduced.

30 Another object of the invention is to provide an improved method for producing a billiard cue by which the production rate can be heightened.

BRIEF SUMMARY OF THE INVENTION

To achieve these and other objects, an improved method in accordance with this invention comprises the steps of: turning a proper length of wood blank into a tapered cue core, wrapping up the core with at least one layer of resin-dipped fiber reinforced fabric to form a clad core, providing a covering tightly pressed onto the surface of the clad core, heating the clad core together with the covering under a predetermined temperature higher than room temperature, and, a certain period later, removing the covering from the clad core.

According to one embodiment of the invention, the step of providing a covering tightly pressed onto the surface of the clad core is achieved by enclosing the clad core with a hollow plastic bag and forming a vacuum between them.

According to another embodiment of the invention, said step is achieved by winding a highly tensioned plastic tape onto the surface of the clad core.

BRIEF DESCRIPTION OF THE DRAWING

Two preferred embodiments of the invention will now be described by way of example and with reference to the accompanying drawing, in which:

Fig. 1 is a block diagram illustrating the manufacturing processes in accordance with the invention:

Fig. 2 is a pictorial view illustrating the process of wrapping up a cue core with two layers of carbon fiber reinforced fabric in accordance with the invention;

- 5 Fig. 3 is a schematic view illustrating the process of forming a vacuum between the cue core and a hollow plastic bag enclosing the core so that atmospheric pressure can be utilized to press the bag onto the core.

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#### DETAILED DESCRIPTION OF THE INVENTION

Referring to the Figures, a cue core 1 is formed by cutting a predetermined length of blank from a proper  
15 kind of wood material and turning it into a tapered shape. The core 1 is wrapped by two layers of resin-dipped carbon fiber reinforced fabric which have been coated with a proper adhesive on the top surfaces thereof as shown in Fig. 2 to form a clad core (not  
20 shown). The fiber orientation in each of the layers is preferably at about  $30^{\circ}$  -  $45^{\circ}$  with respect to the longitudinal axis of the core 1. After the solvent in each of the layers has volatilized to a certain extent, the clad core is enclosed by a hollow plastic bag and a  
25 vacuum is provided between them by means of a proper vacuum device. Thereby, atmospheric pressure can press the bag onto the clad core as illustrated by the arrows in Fig. 3 and consequently the layers can be closely bonded to the surface of the core 1. Alternatively, the  
30 clad core may be wrapped up by winding a highly tensioned PVC tape onto the surface thereof. In this case, the two layers can be closely bonded to the core due to the pressing force provided by the tape. Now the

clad core together with its covering, i.e. the bag or the tape is disposed in a furnace and heated under about 120° -160° to cure the layers of carbon fiber reinforced fabric. A certain period later, the clad  
5 core together with the covering thereof is removed from the furnace and the covering is peeled from the clad core to obtain a unitary billiard cue.

While only two preferred embodiments of the invention  
10 have been shown and described, it will be understood that this invention is not limited thereto since modifications can be made and will become apparent to those skilled in the art.

CLAIMS

1. A method of forming a billiard cue comprising the steps of:

- 5        turning a proper length of wood blank into a tapered cue core,  
wrapping up the core with at least one layer of resin-dipped fiber reinforced fabric to form a clad core,  
10        providing a covering tightly pressed onto the surface of the clad core,  
heating the clad core together with the covering under a predetermined temperature, and  
removing the covering from the clad core.

15

2. A method according to claim 1, wherein the step of providing a covering tightly pressed onto the surface of the clad core is achieved by enclosing the clad core with a hollow bag and forming a vacuum between them.

20

3. A method according to claim 1, wherein the step of providing a covering tightly pressed onto the surface of the clad core is achieved by winding a highly tensioned tape onto the surface of the clad core.

25    4. A method of forming a billiard cue which is substantially as herein described in relation to the accompanying drawings.

5. A billiard cue which is substantially as herein described in relation to the accompanying drawings.

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